



Iron deficiency in female endurance athletes

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Introduction

Iron is an essential micronutrient that performs multiple functions in the human body. If our diets do not contain sufficient iron, we may develop iron deficiency. A lack of iron can be damaging to health and is linked to poor exercise performance. Female endurance athletes are at a higher risk of developing iron deficiency than other athlete populations due to menstruation, the iron losses caused by exercise and the inadequate intake of iron-rich foods. Iron supplementation and dietary modification can help to prevent and treat iron deficiency in female endurance athletes.

Nutrition for endurance athletes

Endurance athletes need to sustain exercise for a long period of time (> 30 minutes). Long-distance running, cycling, and rowing are examples of endurance sports. To perform well and optimise recovery after exercise, athletes need to follow good dietary practices. A varied diet consisting of vegetables, fruits, whole grains, lean meat/meat replacements, low-fat dairy, legumes, and healthy fats is recommended. Endurance athletes need to consume more calories than the general population due to the high energy demands of training and competition. A large amount of these calories should come from carbohydrates, which are the body's preferred fuel source. Sufficient protein and fat intake are also essential. The micronutrient (vitamin and mineral) requirements of athletes do not differ significantly from the general population. However, deficiency of certain micronutrients, particularly iron, can negatively affect health and exercise performance.

Iron deficiency

Iron deficiency is the most prevalent nutrient deficiency in the world and occurs when the body's iron stores become depleted. Iron is a trace mineral, meaning the body requires it in very small amounts. Iron forms a major part of red blood cells, which transport oxygen around the body for energy metabolism. A lack of iron disrupts this process and prevents the body from functioning optimally. If left untreated, iron deficiency progresses to anaemia.

Symptoms of anaemia include fatigue, weakness, headache, and shortness of breath. Both iron deficiency and anaemia negatively affect exercise ability. Adolescent and young women need between 15 and 18 mg of iron per day, which is significantly higher than the daily requirement for males. This is primarily due to the iron lost through menstruation. Indeed, women with heavy menstrual periods are at increased risk of developing iron deficiency and anaemia. Active women are twice as likely to develop iron deficiency than non-active women for several reasons.

- Endurance activities temporarily increase the amount of hepcidin (a protein) in the blood. This prevents iron absorption.
- Impact sports such as running can cause blood cells to break (haemolysis), resulting in iron losses.
- Athletes also lose iron through inflammation, sweating, and bleeding through the urinary and gastrointestinal tract.
- Routine use of nonsteroidal anti-inflammatory medications also contributes to decreased iron levels.

Female endurance athletes need to consume enough iron in their diets to make up for these losses and prevent iron deficiency.

Iron in the diet

Female endurance athletes generally meet their nutrient requirements, except for iron. Iron is an essential nutrient, which means we can only acquire it through our diets. Consuming iron-rich foods can help prevent and treat iron deficiency. Good sources

of iron include meat, poultry, eggs, and legumes. Fortified grains, dried fruit, and dark green vegetables (e.g., spinach and broccoli) also contribute some iron. Even if we consume sufficient iron, our bodies cannot always absorb and use it. Iron in the diet comes in two different forms: haem and non-haem iron.

- Haem iron is found in animal products and is easily absorbed in the gut.
- Non-haem iron accounts for all the other forms of dietary iron and is not as well absorbed.

Our meal and food choices also affect how well iron is absorbed. Vitamin C, for example, enhances iron absorption. This may be why a glass of orange juice goes so well with your eggs in the morning. Other compounds inhibit iron absorption. These include phytates (found in seeds, nuts, and legumes), polyphenols (found in coffee and tea) and oxalates (found in vegetables like spinach). Nevertheless, eating a varied, nutrient-dense diet consisting of iron-rich foods will help prevent and treat iron deficiency.

Vegetarians and vegans

It can be challenging for athletes following restricted diets such as vegetarianism and veganism to meet their nutrient requirements, particularly for iron. This is because iron is not as readily absorbed from plant-based sources. Indeed, iron requirements for vegetarians are up to 80% higher than for non-vegetarians. It is advised that vegetarian/vegan athletes select good sources of iron (fortified cereals, legumes, and nuts) and include vitamin C rich foods in every meal. Cooking with cast-iron pots and pans is another way to increase dietary iron intake. If female endurance athletes cannot meet their iron requirements through dietary means, iron supplementation may be necessary.

Iron supplementation

Correcting iron deficiency through supplementation can improve overall health and exercise performance in female endurance athletes. Iron deficiency treatments include oral supplements (pills/syrups), injections and dietary modification. Athletes are advised to consult a healthcare professional to determine their iron status before taking iron supplements. Taking incorrect dosages or too much iron can result in iron overload, which has significant health consequences. Furthermore, iron supplements may cause some gastrointestinal side effects such as nausea and constipation. Athletes should therefore take supplements together with meals and avoid overdosing. There are numerous iron-containing

supplements available on the market (Table I). An appropriate product should assist female athletes in meeting their daily iron requirement (18 mg) while minimising side effects. Supplements containing vitamin C may assist with the absorption of iron from the product.

Table I: Available iron supplements

Product	Iron content per dose	% iron requirement*
Lifestyle Nutrition: Iron AAC	24 mg	133%
Biogen: Iron Plus	23.4 mg	130%
Chela-fer®	15 mg	83%
Blueiron™ fe	16.7 mg	93%
Ferrous Forte®	20 mg	111%
SiderAL forte	15 mg	83%
Ferovance™	24 mg	133%
Centrum® Multivitamin	10 mg	56%
activovite™ complete multivitamin and mineral	9 mg	50%

*18 mg/day for premenopausal women

Conclusion

Female endurance athletes have high energy and nutrient requirements and are prone to iron deficiency. Iron deficiency impairs health and exercise performance. If iron requirements cannot be met through dietary modification, supplementation may be necessary. Iron supplements have been shown to correct and prevent iron deficiency in female athletes. Athletes should be advised to consult a healthcare professional before taking iron supplements.

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